

Lechuguilla Cave Newsletter

Issue 2, Winter 2006



Introduction

Paul Burger

Welcome to the Winter, 2006 edition of the Lechuguilla Newsletter. The purpose of this publication is to keep cavers informed about what is going on at the park, particularly Lechuguilla Cave. Thanks to all of those who have volunteered to work in the park this year. The expedition proposals were great, and for the first time, all of the proposals were accepted and produced great results.

If you would like to contribute material to this newsletter, please send it to Paul Burger at Paul_Burger@nps.gov. Since this is an electronic-only publication (unless you print out your copy), there are no printing costs, so I also welcome color photos, maps, or whatever you may need to enhance your articles.

Thanks to all of you again, and enjoy the issue.

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Lechuguilla General News

Cave and Karst Management Plan

The new Carlsbad Caverns National Park Cave and Karst Management Plan EA is open for public review and comment until January 12, 2007. This plan addresses changes to policy that have taken place since the last plan in 1996 and helps set some goals for future documentation and management of park cave and karst resources.

Lechuguilla Quadrangle Maps

The updated quadrangle maps are now available in digital form (PDF format) from the park. Hardcopies produced by LEARN have not yet been printed, but should be available early in 2007. For copies of CDs, please contact Stan Allison or Paul Burger.

Lechuguilla 360 CD

Four Chambers Studio in cooperation with the park has produced a CD with 360-degree views of some spectacular places in Lechuguilla. The CD also includes some maps and textual descriptions of many of the features found in the cave. While it is too late to buy them as Christmas gifts, they make great birthday gifts for those friends and relatives who wonder why you keep crawling around under the New Mexican desert. The CDs are available through the park cooperating association at www.CCGMA.org. Some of the proceeds from the sales of this CD go directly towards management and protection of cave resources in the park.

Digital Survey Notes

Thanks to the efforts of two volunteers, Mike and Isabelle Oakley, all of the original notes

from 1993 to present are now available in PDF format. This should make it easier (and much faster) to answer requests for notes to do research on leads and for cartographers to draw maps.

Planet Earth: Caves

This BBC production on caves should be airing on the Discovery Channel in early 2007. The production features some great footage of Lechuguilla and Carlsbad as well as spectacular footage of other caves around the world. The “making of” feature on the DVD will have even more footage of Lechuguilla.

Chandelier Graveyard

Hazel Barton

May 7th – 13th 2006

Expedition Leader: Hazel A. Barton
Trip Participants: Peter Haberland, Vivian Loftin, Pat Seiser, Rainer Straub and Max Wisshak.

Summary

The goal of this Lechuguilla Cave (Lech) expedition was to tidy up a lot of the hanging surveys and bad sketches that were limiting completion of the Chandelier Graveyard +1/+2 (H/I 36/37) Quad Levels. Six participants worked over the course of five days in two survey teams, and were successful in this goal; a significant amount of survey footage was obtained and the teamed successfully accomplished nearly all of the pre-determined expedition goals. The survey totals for the expedition are as follows:

New survey:	1013.35 feet
Resurvey:	2419.95 feet
Total survey:	3433.30 feet

This reflected 90 new survey and 118 re-surveyed stations, which were also inventoried during the expedition. The aims begun or completed during the course of the expedition

are shown in Attachment A. 8.5 of 9 (95%) of the primary and 5 of 8 (62.5%) of the secondary aims for the expedition were completed, while a significant start was made on 2 of 6 (33%) of the tertiary aims during the expedition. Together, this work should significantly contribute to the completion of the Chandelier Graveyard quads, with a good ‘start’ being made on the Escher Underground (EU) Maze.

Expedition Overview

Once again we were able to assemble a geographically diverse group of cavers, from New Mexico, New York, Ohio and Texas and with the noted addition of two international cavers from Germany (Rainer Straub and Max Wisshak). The expedition was limited to six participants due to the anticipated aims that needed to be completed and the difficulty in managing multiple teams within the Chandelier Graveyard maze areas.

During the week, the teams spent quite a deal of time tracking down surveys through the EU maze, which was nicknamed ‘Escher’s Underground’ Maze, due to the complexity of interconnected passages. In many instances, previous surveyors had not taken time to sketch the survey connections between multiple stations, making re-sketch and field orientation necessary to complete the quads. The cartographer was also heard to complain throughout the course of the week how it was “...not fair that I’m afraid of heights and they gave me a vertical maze!”

Day-by-day Narrative

Monday May 8th

Team 1 – Peter Haberland, Rainer Straub, and Max Wisshak headed up to the Chandelier Graveyard to re-survey the EYEZ survey. After being given incorrect directions from Hazel, they were able to locate the survey heading off along the ledge, just below the anchor knot of

the Graveyard rope. After a short traverse along the balcony with spectacular vistas of the Western Borehole, they began the EYEZ resurvey. Almost immediately the back fell off of the CAVE #2 inclinometer, allowing the pendulum module to fall out. Even while Rainer and Max were able to fix it with duct-tape, they were unable to get accurate readings. They therefore continued the EYEZ survey by handing the inclinometer they did have back and forth. Fortunately, Pat had brought along her personal instruments for the expedition,



Unusual wall structure at EGE18.

and we were able to swap out the inclinometers for the rest of the expedition. During the survey, Peter started to suffer debilitating back pain while sketching, and was unable to continue after the EYEZ survey was complete. Max then took over sketching duties and the team traveled to Steve's Room on the other side of the Graveyard to resurvey EYEAB1-4 before heading back to camp. The team returned to camp by 9 PM.

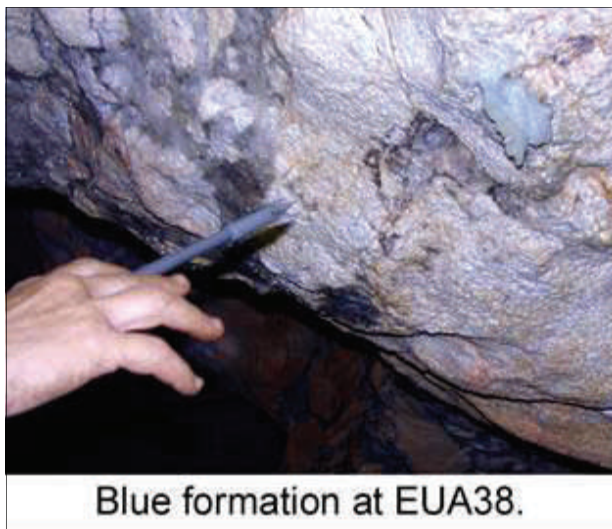
Team 2 – Hazel Barton, Vivian Lofton and Pat Seiser began by attempting to fix many of the survey blunders from the previous expedition. The team began by relocating the EC60 station above Lake Louise and resurveyed the connection between EC60A and EC60B. During the survey, Vivian noticed that there were older EC60A and B stations already

flagged, suggesting that this may have been the source of the survey error that was identified. The newer stations were re-labeled EC60A' and EC60B' in the cave (and dated). The team then relocated EC54I-J, for a resurvey and re-sketch, but was unable to relocate ECD16-17 and ECV47-48 without the original data. We will endeavor to locate and fix these errors on the next expedition. Finally, the team climbed up the Cornflake Climb and fixed the survey errors from ECD57-60. During this re-survey, Vivian found a pit lead in the floor. As this was her quad, Vivian was confident that this pit had not been explored and climbed down. Using webbing, she was able to determine that the pit led to another pit that required vertical equipment, and the pit was left for a later day.

The team then headed up into the Chandelier Graveyard and began work on fixing the EGEB survey notes. The team located EGE18 and noticed an unusual 'inverted mushroom'-type formation in the wall. After taking photos for the inventory, we headed down and began the resurvey at EGEB6-8, whereupon we dropped down into the EGD survey and tied into EGD24. We then determined that the EGEB survey continued over an extremely exposed traverse. Hazel decided to make a more determined effort to find the original notes in the Park offices, so no one need risk imminent death unnecessarily.

Undeterred, the team noticed a pit off of EGD24, which they surveyed to, before determining that vertical equipment would be needed to continue. While they were finishing up the survey of this pit, Pat dropped her glove down it, requiring its recovery later in the week.

Finally, with some time left, the team headed into the last big room of the Chandelier Graveyard level and began the resurvey from EYE35-38 and field orientation for the cartographer along the EU survey. The team noticed and photographed blue formations at EUA38, before returning to camp by 9:05 PM.



Tuesday May 9th

Team 1 – The aim for the first team, comprising of Peter, Vivian and Rainer, was to push many of the vertical leads/pits that had been discovered. Leaving camp at 9:00 AM, this team began by rigging the rope at the pit discovered yesterday (at ECH59). As the team began rigging the rope, Hazel was below collecting water at Lake Louise and could hear the team descending. She was able to call to Vivian and let her know that they were connecting into known passage, allowing Vivian to sketch/record data, without anyone descending the pit and potentially damaging the Hoodoos/Raft Cones below. The team surveyed 4 stations before tying back in.

The team then examined the last remaining pit lead off of the Borehole level, at EY32. The team rigged the pit, only to tie the survey back into EY33E shortly thereafter. Finally, the team rigged the rope at the EGD24 pit discovered yesterday. Once the pit had been rigged, the team was able to determine it was safely free-climbable with the rope as a belay, although this was not possible to determine from above. Once down the pit, the team determined that they were again in previously surveyed passage, and tied into EGD25I. Unfortunately, as the rope was piled up at the bottom of the pit, it hid Pat's glove, which would need a later trip for its retrieval.

The team returned to camp at 8:35 PM.

Team 2 – Hazel, Pat and Max headed out from camp at 9:30 AM and headed back to EYE35 in the Graveyard to complete the sketch begun yesterday. The team followed the survey to EYE37, whereupon they found a big, scary pit! Nonetheless, there was a higher-level passage heading off that had not been surveyed and the team headed into this passage. About halfway along this passage was a short, but awkward climb heading into the ceiling. As Pat attempted to climb this, a foothold broke. Although Pat only fell a couple of feet, she fell against crystals and badly scratched her upper arm. While Pat recovered at the bottom of the climb (preventing blood from getting on the cave), Hazel and Max finished the survey.

The team then back-tracked to EYE35, where they had a number of first aid supplies and were able to patch Pat back into functional form. The team then began the resurvey of EUA50-75, for which the notes were unusable. This survey took the team back to the pit at EYE37, at the bottom of it this time, in a complicated boneyard maze; there were some rather nice fossils at EUA53-55 that Max (a geologist) was able to accurately identify for the inventory.

At EUA64, Max also found a pit lead that blew good air and was covered in gypsum. While the lead looked good, it was getting late, so the team finished up the survey as far as EUA70. The team headed out of the Graveyard via the EU rope series, inventorying the ropes as they went.

The cartographer also realized during this exit that the EU series will also require quite a bit of future work. The team headed back to camp, whereupon Hazel noticed the EYOB rope that she had rigged in March '99 (but had not had a reason to go this far along the borehole since!), and pulled it for rigging up to the Graveyard. The team arrived at camp at 8:30 PM.

Wednesday May 10th

Team 1 – Hazel, Peter and Pat headed out at 10:15 AM. As Pat was having an allergic reaction to her kneepads, the teams decided to carry out their planned goals in the PHD Room earlier than planned, thus avoiding too much crawling for the day. The team headed out to the Graveyard and Peter (assisted by Rainer and Max) re-rigged the Graveyard drop with the EYOB rope. The original Graveyard rope was pulled and returned to the Park at the end of the expedition. During the trip up to the PHD Room, Hazel confirmed her hypothesis that the microbial activity followed the ascending moisture-rich air with more corrosion residues and greater microbial activity as the team climbed the rift up into the PHD Room, with active Actinomycete colonies at the top of the third rope. As the team ascended the last rope into the PHD Room, they noticed that it was poorly rigged, rubbing on a number of points as it corkscrewed around up into the room. At the top, the rope had been tied in a butterfly knot due to a rub-point at the lip. The team began with a resurvey of the main room due to bad sketch, noticing a number of locations where unusual corrosion of the rock was taking place. Due to sketcher burn-out, the team headed out of the room at 6:30 PM, inventorying the ropes on the way down. As Hazel passed the first rope, she noticed that a second rub-spot had developed in the rope, about 20 feet below the lip. Undeterred, the team continued down, returning to camp by 8:30 PM.

Team 2 – Vivian, Rainer and Max headed up to the Chandelier Graveyard and PHD Room via the rope series. Following Max taking photographs of the room, as requested by the Park, the team headed up onto the higher level balcony of the PHD Room and surveyed along the wall. The team were unable to relocate many of the upper level survey stations and set new ones as indicated in the notes. The team also found an original science station in the wall at EYEYA2 and took photos for the

investigators. As the team headed out of the room, Max noticed that the first rope was worn down to its core. He climbed back up and the team pulled up the rope to re-rig it, removing the damaged section. This unfortunately meant that the rope was too short to descend, so the team took 20 feet from the bottom of the rope up to the upper level of the PHD Room and tied this on the end, allowing them to exit. The team successfully made it back to camp by 9:05 PM, and determined that no more trips could ascend the Graveyard rope until it was re-rigged.

Thursday May 11th

Team 1 – Vivian, Rainer and Max headed back up to the Graveyard and went to the lead found by Max at EUA64. The lead did go, although the passage was very delicate, so the team used the disto to get many of the distances without impacting the cave. The lead went to a small, lower level room before tying back into known passage at EY55L32. The team then tied the survey back into the Lost World Room, before traveling back down to the Western Borehole via the EU Rope series. The team headed to the EY62 rope for the EGG2 resurvey. Unfortunately, by the time the team located the rope, it was too late to be able to justify climbing it. The team therefore headed back to camp, taking photographs in the Western Borehole as they traveled, arriving at 8:35 PM.

Team 2 – Hazel, Peter and Pat headed back to the Graveyard to finish up the EYEZA resurvey. The EYEZA survey is a very delicate area, with significant gypsum needles and hairs at the entrance. The team were able to avoid these formations and found a number of areas that also required additional survey, which had been left as open leads in the original survey. At EYEZA5, the team checked the 'hot' lead from the original survey. There was a significant amount of air blowing out of this lead, and Peter headed down. The lead turned out to be very tight, led to a boneyard maze coated in gypsum and was difficult to get out of. We

decided to leave the lead for another day, finished the EYEZA survey and headed over to finish off the EGAD survey, which connected the Chandelier Graveyard with Steve's Room. Due to the delicate nature of this survey, Peter climbed into it to confirm the connection, while Hazel and Pat walked around to limit impact. Once the EGAD survey was completed, Peter climbed up to EYE26E and confirmed that there was a rope coming out of the EJ survey, which provides a backdoor entrance to the PHD Room. This also confirmed that the original notes are incorrect in stating the survey ties into EYE16, rather than the EYFY16 station in the PHD Room, should that prove necessary. We made sure this correction was made with the Park. The team then returned to EGD24C, and Peter was able to climb down and retrieve Pat's lost glove. The team then checked the 'hot lead' at EVG2, which ended in an alcove – although the cartographer did notice significant problems with the current EVG sketch. Pat's knee then started to bother her again, so the team returned to camp, arriving at 8:30 PM.



Sponge Fossil at EGAD3

Friday May 12th

Team 1 – Peter, Pat and Max left camp at 9:00 AM and headed back to the Graveyard, where they re-sketches and re-surveyed the EVG and EYF surveys. The team did find extremely delicate areas in leads at EVG3A – E and EYF11A – B. The area the team was working in was so complicated that Max decided a good

name for it would be the Escher Maze, whereupon the team decided that Escher's Underground (EU) Maze would be a good name for this complex boneyard maze. The team did note that the original survey at EVF9 was not flagged and down at the bottom of an un-climbable pit, suggesting that this station had been 'virtual' in the original survey. Finally, the team stopped surveying at EYF4 due to sketcher burn out, returning to camp by 8:45 PM.

Team 2 – Hazel, Vivian and Rainer headed out of camp at 10:00 AM toward the Graveyard. On the way, the team checked the blunder at ECV15-EY20LL, whereupon Vivian remembered that the survey station could not be read during the survey. Therefore, the designation 'EY20LL' is probably incorrect, and this shot should be deleted to remove the survey error. The team then headed to the EY62 rope and climbed up to re-sketch the EGG2A-F survey. The team then attempted to find EGGA5 to check whether the pit really did drop into the Western Borehole, which didn't match the map. Despite a whole bunch of looking around, the team were unable to find EGGA5 in the mapped location. The team then went to check the lead indicated at EGHA2. Unfortunately the original notes were completely incorrect, and the 'hot' lead was actually the passage going around a bedrock pillar that was only 4 inches in diameter! Nonetheless, Vivian started pushing a small lead to the north of EGHA2 and managed to find a boneyard maze that had been overlooked, probably because it began with a belly-crawl over 3"-long dogtooth spar (which we named the Tiger's Teeth). This crawlway led to a nice room, which unique tiger/cheetah-stripe manganese striped deposits, for which we named it the 'Tiger's Den'. There was a small pit in the floor of this room that looked like a good lead, although we believed it simply tied into the Western Borehole or the EGD survey. To test this, we dropped down a rock with some red/white flagging wrapped around it. We

then back-tracked to the EY62 rope and did a circumference of the Graveyard within the Western Borehole. While we didn't find our flagging, we did find the EGGA5 pit in the wrong place! On the way back to camp, Rainer did a lead climb near EY44, into Hazel's hot lead. Unfortunately this turned out to just be an alcove, which the team resurveyed before heading back to camp, arriving at 8:45PM.

Southwest Branch Expedition

May 13-20, 2006

Andy Armstrong

Expedition Leader: Andy Armstrong

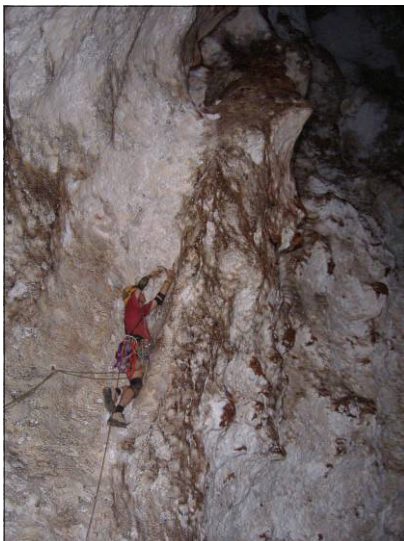
Participants: Mark Andrich, Bonny Armstrong, John Lyles, Paul Mozal, Larry Shaffer

New survey: 3033 feet

Resurvey: 313 feet

This expedition was focused on leads remaining from the early years of Lechuguilla exploration, specifically climbs. In March, a reconnaissance trip was made to the climbs in question in order to assess the gear and techniques that would be utilized. This allowed the team to bring in the proper gear needed on the expedition.

The first climbing lead attempted was the dome at FL9 in Fluted Hall. This lead was left in 1988 at the end of a marathon day of survey that saw



Paul Mozal on
Anvil Cloud
Dome climb.

Photo by Andy
Armstrong



Anvil Room. Photo by Andy Armstrong

the discovery of the Chandelier Ballroom and Prickly Ice Cube Room. The dome at the end of Fluted Hall was the most promising lead on the 2006 proposal, so it was begun on the first day of survey. After two days of climbing a room was discovered at the 130 foot level above Fluted Hall. The room was shaped like an anvil and had dimensions of 80 x 30 x 25. At the end of Anvil Room the passage ended near a nice display of large crinoids. Two articulated bat skeletons were also found here. Anvil Cloud Dome was climbed upward for another 80 feet, but no passage led from the top. The breakthrough occurred back at the Anvil Room level by traversing across the pit into continuing passage. This passage was highly corroded and was named Acid Rain. From here passages radiated out on a level plane. The whole area eventually became known as Flatlands because of its level passages. Flatlands includes Acid Rain, a side passage called Acid Reflux, a 70 foot dome pit named Dew Point Drop, a trunk passage named Powder River, and a large ascending passage called Poo Holler. The area contains massive deposits of brown corrosion residue and rock flour. Acid Rain also features nice deposits of montmorillonite. There are also deposits of water washed silt that are very odd for the cave. In several places, Flatlands connects to large known rooms below. The bottom of Dew Point Drop leads to an overlook of Ski Hill Pass. The connection was

discovered by hanging long flagging off the balcony and locating the flags from below on the way back to camp. Another pit off of Powder River drops into the ceiling of Prickly Ice Cube, near the top of the room. In all, Flatlands comprises nearly one half-mile of survey and required several lead climbs to explore. Ten leads were left.

Discoveries were made in other parts of the Southwest including the Voids and Deliverance Passage, where a the Chameleon crawl led 250 feet north into the blank spot between the West and Southwest branches. Leads were checked near Underground Atlanta, and a blunder was repaired in Chandelier Maze. High impact areas were photographed in Chandelier Ballroom to be used in conjunction with the Ray Keeler impact map produced in 2005.

The expedition was successful in that 3033 feet of new survey was accomplished, the majority of it in the new section known as Flatlands. 313 feet of resurvey was done. The team hopes to return next year to continue the exploration of Flatlands, and to climb the other domes that were scouted in 2006.

Southwest Branch Climbing Expedition

Patrick Cicero

July 2-7, 2006

The intent of this six day expedition to the Southwest Branch was to climb into the Trepidation Dome, a large approximately 30ft diameter opening in the ceiling of the Prickly Ice Cube room to look for continuing passage. The opening to the Trepidation Dome has a large stripe of corrosion residue, which often is indicative of airflow. The team consisted of four cavers, three of whom are technical lead climbers: Stan Allison, Patrick Cicero, David Levy, and Aaron Stockton. In addition to the Trepidation Dome climb, the team intended to climb several other shorter high leads in the



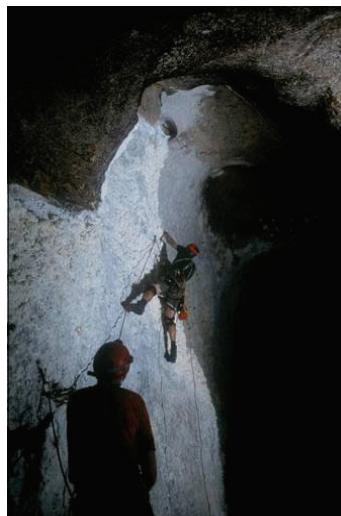
Dave Levy drilling a removable bolt placement on the Hammer Time climb while Stan Allison belays

Photo by Patrick Cicero

Southwest Branch.

The team started with one of the shorter high leads, a 25 ft blank wall up on the Prickly Ice Cube Room Overlook. Patrick, Dave, and Stan took turns leading sections of this short but hand drilling intensive climb dubbed "HammerTime". The team used a combination of hooks, 5/16" removable bolts, and 3/8" stainless steel bolts to aid their way up the A2 rated climb. Only two 3/8" permanent bolts were placed for protection.

This climb led to the discovery of a new area that was named Crazy Tasty Town in honor of an excellent cave delicacy known as the Spam Single. Crazy Tasty Town was quite delicate with massive gypsum, aragonite, and popcorn



Stan Allison climbing up into Crazy Tasty Town while Patrick Cicero belays

Photo by Aaron Stockton

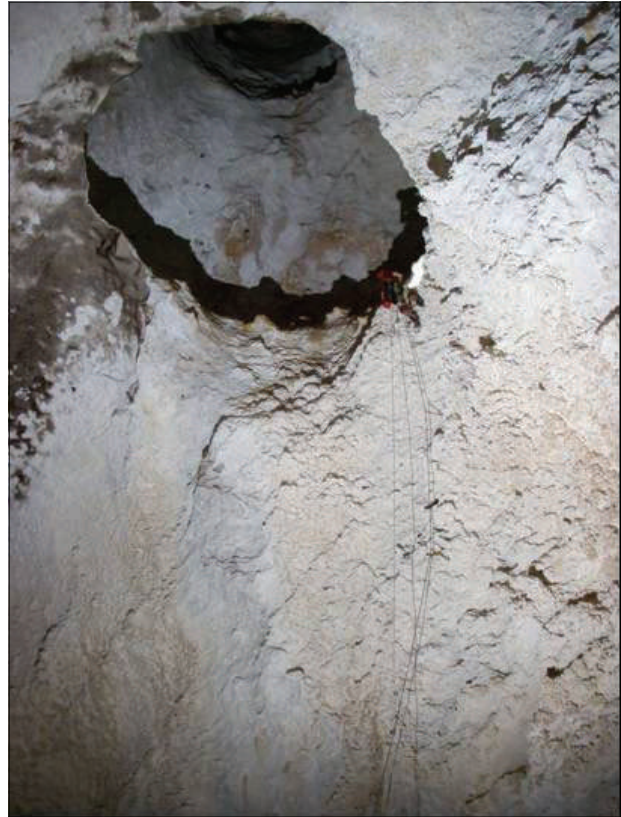
on the floors and walls along with several clusters of possible endellite and some bat skeletons. In the main room there was breccia on the floor with massive limestone on the ceiling. Off from the main room, the passage consisted of boneyard with corrosion residue in many of the passages. The team surveyed very carefully to minimize the impact to this new area and only a few small tight leads remain. The total new survey for Crazy Tasty Town was 1030.6 ft.

When the team climbed up into the Trepidation Dome they used a combination of freeclimbing and aid climbing via hooks, tricams, slung popcorn, removable bolts, and stainless steel



Stan Allison climbing on the Prickly Pear Wall, with the Trepidation Dome entrance visible overhead (Note corrosion residue stripe near the opening)

Photo by Aaron Stockton



Stan Allison at the lip of the Trepidation Dome
Photo by Patrick Cicero

permanent bolts. The lower part of the climb consisted of very delicate (A2+) climbing on aragonite/popcorn covered massive limestone. On this section, the team discovered that aragonite crystals imbedded into the palm feel like prickly pear cactus spines. Thus the wall below the entrance to the Trepidation Dome was named the Prickly Pear Wall. To minimize damage to the aragonite crystal/popcorn wall coating and to reduce the risk of falling, the team climbed slowly and methodically up the wall.

To further reduce the impact to the cave, they placed only four 3/8" diameter stainless steel protection bolts in the 80 ft of climbing required to reach the first ledge system inside the Trepidation Dome. On this ledge system, fourth class climbing allowed access to the other side of the dome, but no leads or passageways were found. The Trepidation Dome continues upward for another 75 ft and another ledge system is clearly visible near the

top of the dome. On the next expedition, the top of the dome should be reached and the second ledge system will be investigated and surveyed. The total new surveyed passage for the Trepidation Dome thus far is 170.15 ft. This brought the total survey for this expedition to 1200.75 ft, with two new climbing leads explored. Several other high leads on the Prickly Ice Room Overlook were eliminated since they led into sections of Crazy Tasty Town that had already been surveyed. Overall, the expedition went quite smoothly. The team worked together very well, climbing was completed without falls and with very minimal impact to the cave environment, and 1200 ft of new passage was discovered.

Far East Expedition

July 2-9, 2006

Ron Miller and Rich Sunquist

Team: Midori Sundquist, Carol Vesely, Steve Maynard, Daniel Chailloux, Cathy Borer, Art Fortini

SURVEY TOTALS

Total: 3,627.8 feet;

New Survey: 2,852.7 feet;

Resurvey/resketch: 775.1 feet.

SUMMARY

Exploration and New Survey

Teams checked and surveyed several leads, most of which had been previously identified. Checked leads and their outcomes are summarized below and detailed in Table 1.

In the Coral Sea area, we surveyed 2,618 feet of new passage. A previously unnoticed lead at MNY3C led to 1,696 feet of new passage, generally east and south of the areas discovered in 2005. A climbing lead in the Hall of the Dancing Bears led to two more climbs and 666 feet of survey, mostly in vertical boneyard in an onion-skin-like layer behind the main wall.



Coral Sea — Lake Aloha in Independence Hall
Sunquist Photo

The discoveries in the Coral Sea beyond MNY3C include two large rooms (Independence Hall and the New Guinea Room) and several passageways that are well decorated with flowstone and dripstone deposits, and numerous lakes and pools. Although several leads remain, further exploration will be challenging from a conservation standpoint due to extensive intermixing of flowstone and “grape” coralloid covered passages with decomposing spar-matrix breccias and corrosion residue covered areas. In some small passages, the floors are “clean” flowstone, and the walls and ceiling are decomposing rock or are corrosion-residue covered, requiring great care to preserve the pristine nature of the floors.

The Coral Sea now comprises over 4,600 feet of surveyed passage. This area is clearly distinct from the Outback both in location and in character. It represents an eastern extension of the Outback, and its high density and variety of flowstone, dripstone, aragonite formations and its many lakes and pools are in sharp contrast to the dry, largely featureless Outback. According to the Compass database, the current limits of the Coral Sea are the farthest from the cave entrance of the entire Eastern branch, making this area one of the most remote areas within what is certainly considered to be the most remote branch of the cave.

Resurvey/Resketch

At the request of the Far East cartographers, we completed the following resurvey/resketch tasks: • Resketched GYN1-5 and GYO1-5 in the Land of Enchantment area, showing the relationship between the surveys in areas where they share the same general fissure passage.

- Resketched GDF1-7, also located in the Land of Enchantment area;
- Resurveyed MNL12-21 and MNLA1-4, resketched MNL12-19 and added cross sections to both surveys, which are located above Flake Lakes in the upper Outback.

Error Corrections

We undertook two loop-closure error correction tasks. In the MNL12-24 sequence, the source of the loop closure error appears to have been a mislabeled station. In the second sequence (GYG3 > MYF6 > MYF7 > MQR11 ... 11 > MQP6), we were unable to locate the second station. While preparing this report, however, we determined that the source of the error was a data entry error in the tie-in station; correction of this error reportedly corrects two of the remaining 10 significant loop closure errors in the Far East (Peter Bosted, personal communication, 2006).

Microbiological Sampling

As part of an ongoing study by Dr. Diana Northup of microbially mediated speleogenic processes, we collected samples of corrosion residue and underlying punk rock from three locations along the rescue route between Grand Guadalupe Junction and the Ruby Chamber. This work was conducted under Dr. Northup's sampling permit with prior approval from the Cave Resource Office.



Coral Sea— Crinkle Blisters
Photo by Sundquist

Daily Activities

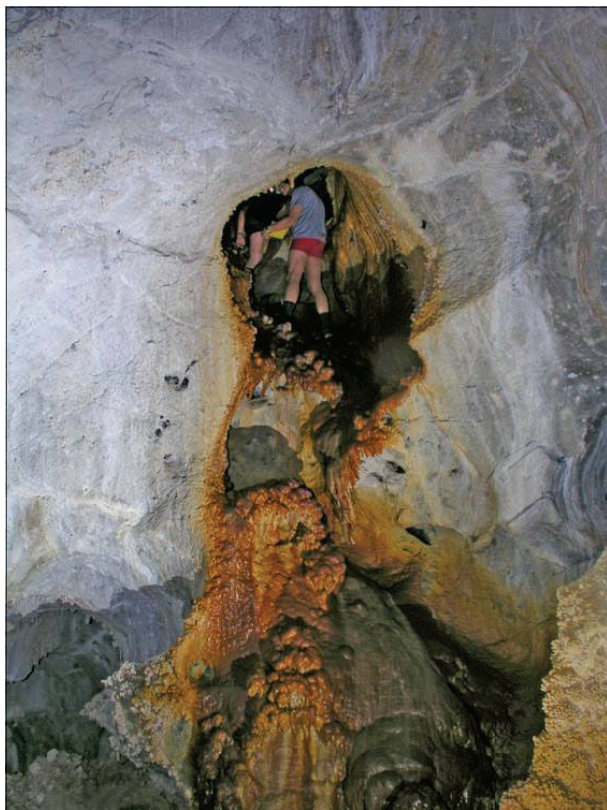
Sunday, July 2

The eight team members entered the cave Sunday morning, and proceeded without significant incident to the Far East camp; travel times ranged from 8 to 11.5 hours. At the Aragonitemare, two team members had difficulty communicating between the balcony and the bottom, but eventually were able to hear each other after one team member moved out from the alcove located near the base of the climb.

Monday, July 3

Steve, Daniel and Midori resketched GDF1-7, GYN1-5 and GYO1-4 in the Land of Enchantment. The GYO survey had previously been resketched, but Joel Despain, the cartographer for this area, had requested that GYN and GYO be resketched together in areas where they share the same overall fissure.

Steve notes that this fissure passage represents a nice example of the zonation of mineral deposits, with weathered, corrosion-residue covered bedrock in the upper section (GYO survey), beautiful rillenkarren development with popcorn and aragonite in the middle section (GYN survey), and a possible acid lake level at the base.



Independence Hall - Photo by Daniel Chailloux

Rich, Cathy and Carol surveyed (MNY10+) several leads out of the Coral Room in the Coral Sea, tying in to MNL12L. One of the leads tied back to previously known passage, at MNL10. Only two known leads, one of which is a climbing lead, remain in this area.

Ron and Art did a climbing lead off MOD6 in the Hall of the Dancing Bears. Art was able to toss a rope through a pillar, enabling him to complete the 15-foot climb on a top rope, with the potential for a moderate pendulum in the event of a fall.

This climb, which he named Nutella Pumpkin Pie, went at about 5.6 (bouldery start), and led to largely high-angle boneyard passage (MODA survey) in an onion-skin type layer behind the wall of the room. Several passages led back to windows overlooking the main room, eliminating many of the climbing leads out of Dancing Bears. They left several leads for the following days.

Tuesday, July 4

Rich, Midori and Carol returned to Coral Sea to survey leads in the MNY survey. After surveying several leads that either ended quickly or returned to known passage, Rich noticed a small, previously unidentified lead near MNY3C, which Midori pushed into an eight-foot-tall, 15-foot diameter room. From this room, a flowstone-covered crawl led up into a large room. The room, which they named Independence Hall, is about 30 feet wide, 80 feet long and 25 feet tall. It contains a significant amount of brown and yellow flowstone, and a sizable lake, which they named Lake Aloha, along its southeastern end.

The team changed into clean clothes before entering the room, then began the MOR survey. Initially, exploration to the southeast appeared to be blocked by Lake Aloha, but the team found a boneyard route along the southwest wall that bypassed the lake and led into another sizable room on the far side that was also well decorated with flowstone; they named this the New Guinea Room.

Except for a short section near Lake Aloha where boots are needed, passage through this area is largely in full “clean mode” - a clean shirt and shorts, aquasocks, cleaned packs, and no kneepads or gloves.

Steve, Cathy and Daniel went to the lower Outback to check known leads in the MF survey, a remote area at the very bottom of the Outback. The pancake lead at MF14, which had been described as 35 feet wide and one foot high, was pushed for about 20 feet before becoming too tight. Other leads connected back to known passage in the MF survey.

Ron and Art returned to the Hall of the Dancing Bears and continued the MODA survey above the Nutella Pumpkin Pie climb, but left numerous unchecked leads, including a higher level climb from a balcony overlooking Dancing Bears.



New Guinea Room
Photo by Sundquist

Wednesday, July 5

With so many promising new leads in the newly discovered Independence Hall area, we decided to send all three teams to survey in the new area.

Rich, Ron and Cathy started the MOE survey in the New Guinea Room. Working in full clean mode, they headed northeast in large (typically 35 feet wide and 20 feet tall) passage that was highly decorated with massive brown flowstone formations. In the first 100 feet, they found two small lakes, and made a visual connection to Lake Aloha.

Farther on, another lake blocked the passage at the main level, but they were able to bypass it by climbing up into a short boneyard tube that led immediately back down to the far side of the lake. Beyond this lake, the passage headed southeast past a small pool before turning north and ending in a room with two small pools. They surveyed three side leads, and left several others, some of which would have required transitioning back to “dirty” mode (normal caving clothes).

Steve, Midori and Daniel began the MOW survey in the newly discovered Independence Hall. Working in clean mode, they headed west from where the discovery team had entered

through a hole in the floor, climbing up to two balconies overlooking the room (no ropes needed). They also surveyed (MOX) southeast and down from the hole in the floor of Independence Hall. The team checked for a possible route around the northeastern side of Lake Aloha, but found it to be too delicate, as the entire floor is covered with aragonite bushes.

Carol and Art, also working in clean mode, continued the MOR survey southeast from the New Guinea Room. They headed up into boneyard with calcite-coated walls and delicate aragonite. As they surveyed, they passed several boneyard leads that headed in various directions and ranged in size from small crawlways to walking-sized passage. At MOR22, they climbed down (no rope needed) into an eight-by-ten foot room with corrosion residue and several leads, but did not continue because they did not have “dirty-mode” clothing with them.

They returned to MOR15 to survey a lead that went through a flowstone hole and up a large mass of flowstone above the room at MOR12. From the top, a bridge of flowstone appeared to lead into more boneyard passage on the other side of the room, high above the floor, but they opted to leave this for a future team.

Thursday, July 6

Rich, Carol and Cathy returned to the Independence Hall area. They surveyed the east side of Lake Aloha, and pushed a large balcony lead above the room that led to an area covered in corrosion residue, where they stopped to avoid dirtying their aquasocks. They then continued the MOE survey, which reconnected to known passage at MOE13-14, although they did not close this loop. A lead at MOE21 led to a small room with two remaining leads, both of which were subsequently pushed and surveyed.

Steve, Midori and Daniel headed to the Hall of the Dancing Bears, where they planned to push leads beyond the MOD13 climb. At the request

of the climbing team (Ron and Art), one team member retrieved the 100-foot 8 mm push rope from near the entrance to Independence Hall, and sent it up to the balcony above Dancing Bears. They then headed up the fixed rope at MOD13, and rigged the Milky Way drop with a 60-foot rope. Unfortunately, they did not realize that a 60-foot rope is only adequate if webbing is used for the anchor, so the first team member down had to climb back out.

They decided to survey the leads at MOD29, located near the top of the Milky Way pit. However, as they prepared to survey, they discovered that their Disto laser range-finder case contained a camera instead of a Disto (apparently one of the team had a camera case of similar appearance), so a team member headed back down into Dancing Bears, persuaded the climbing team to send down their Disto, and headed back up to re-join the team. The team surveyed two leads near MOD29, leaving two tight and delicate leads.

The team observed what Steve (a geologist) believed to be graphite, occurring as concentric bands in silt pods and as disseminations in the spar-matrix breccia in the footwall of a high-angle fissure. This observation proved to be controversial; others familiar with minerals in Lechuguilla Cave have suggested that the substance was probably a manganese compound.

Ron and Art returned to the Hall of the Dancing Bears to undertake a climbing lead in the MODA survey (MODA9A) that began on a balcony above the Hall of the Dancing Bears. They were able to rig a top rope belay out of an upper-level window, which was nearly directly above the lower half of the climb, but had a substantial pendulum-fall potential for the upper half. Ron completed this climb, which went at about 5.9, happily arriving at another comfortable balcony after about 50 feet.

A hole behind the balcony led to a sloping flowstone ramp high in the Hall of the Dancing Bears, eliminating the need to do the climbing lead at MOD14. No leads were observed above the ramp, and the far side of the ramp was determined (by a light connection with Steve's team) to connect to a climbing lead at MOD24 (near the top of the MOD13 climb).

From the left end of the balcony, Art climbed a left rising traverse, which he named Snoopy and the Chicken (5.4 A1). At the top, they found a short passage that led to a phonebooth sized room, with a terminal pool beyond and a well decorated room visible beyond a flowstone and calcite-coated window on the left. Since they had given away their Disto earlier in the day, they had to leave the survey of the climb and the passages beyond for the next day.

Friday, July 7

Carol, Cathy and Midori completed loop-closure error correction and resketch tasks in the Outback. They resurveyed MNL12-21 and MNLA1-4, resketched MNL12-19, and added cross sections for the MNL and MNLA surveys. The apparent primary source of the blunder in this area appears to have been a mislabeled survey station (MNL21 was labeled MNL20).

The team noted multiple boneyard and pancake leads near MNL15, one of which was surveyed (MNJ) back to MNL6, above Flake Lake. They also noted several leads around MNL20-21 and in the MNLA survey, but did not have time to push them. They also completed restoration work on the Purple People Eater formation and the flowstone slope below.

Rich, Steve and Daniel headed northeast of the New Guinea Room, where they surveyed several clean-mode leads off the MOE survey, leaving several modest leads, most of which contain corrosion residue.

Ron and Art headed back to Dancing Bears, ascending the 8-mm fixed rope up to the MODA16 balcony very carefully, climbing in aquasocks to avoid impacting the flowstone and drapery, and to minimize abrasion in the rope where it crossed the lip near the top. After re-climbing the Snoopy and the Chicken traverse, they changed into full clean mode in the phone-booth room to complete the flowstone squeeze.

On the far side of the squeeze, they discovered a room, about 25 feet wide, 30 feet long and 10 feet high, filled with flowstone, calcite coating, calcite crusts, crinkle blisters and aragonite, and numerous small pools. They surveyed this room and an awkward flowstone climb above the entrance squeeze, leaving only two small leads out of this room.

To facilitate a return trip without needing to re-climb Snoopy and the Chicken yet again, they fixed the 100-foot 8 mm static rope at the top, and rappelled back into the Hall of the Dancing Bears.

Saturday, July 8

We opted to have this be a short work day, because the discoveries of previous days had resulted in each “morning” getting later and later, and we wanted to get back to a normal schedule before heading out.

Cathy and Art headed over to the rescue route between Grand Guadalupe Junction and the Ruby Chamber, where Cathy (a PhD biologist with extensive experience in sterile sampling technique) collected samples of corrosion residue and underlying punk rock for bulk chemistry and DNA analysis.

The three sampling locations were documented, surveyed, and photographed; the field-sampling documentation was submitted separately to Dr. Northup. This work was conducted in support of Dr. Diana Northup’s research on microbially-mediated speleogenic processes, under Dr. Northup’s sample collection permit

and with pre-approval from the Cave Resource Office.

Ron, Midori and Steve attempted to correct a loop closure error (GYG3-MYF6,6-7,7-MQR11, 11..1,1-MQP6), but were not able to travel beyond the first station. The reported shot from GYG3 to MYF6 would have been directly into a solid flowstone slope in the base of a vertical fissure, and the only other possible direction of travel was blocked by a deep, unroped hole in the middle of the fissure. An attempt to reach the sequence from MQP6 from the other end was also thwarted when the team, none of whom had brought climbing gear, encountered an unexpected rope on the trade route to this station.

However, later review of the original GYG and MYF+ survey notes was able to resolve this blunder. Both sets of survey notes indicate that the tie-in station was actually GYG8, not GYG3 as listed in the Compass data. According to Peter Bosted (personal communication, 2006), this correction resolved two of the ten remaining significant loop closure errors in the Far East.

Rich, Carol and Daniel opted to stay close to camp for the short day, which allowed Daniel to complete some stereo photography of nearby open areas, all from within marked trails. In the La Morada Room, the team removed flagging from above a pool that was labeled “drinking water”, and also picked up an old cave map and removed it from the cave.

Sunday, July 9

We headed out in three sub-groups, separated by about 20 minutes each. The short spacing caused some significant waits at the Aragonitemare, but all teams exited the cave without incident. Travel times from camp to the entrance ranged from 8 to 11 hours.

General Notes

Conservation

- Teams seeking to continue exploration in the Independence Hall area should be prepared to make multiple clothes changes, sometimes in cramped conditions, which will substantially slow the pace of survey work. Extreme caution is needed in several areas, especially the Lake Aloha bypass route, to avoid touching corrosion-residue covered walls and ceilings and fouling “clean-mode” gear and the nearby lake. All changing areas have been flagged and labeled. Also, numerous “clean-mode” areas require great care to avoid damage to closely spaced aragonite bushes, popcorn and crinkle blisters.

- When an active flowstone area becomes a travel route for multiple teams, cavers should be prepared to undertake “self-restoration” efforts. One suggestion for minimizing microbial cross-contamination would be to leave small pitchers under water drips in these areas, to facilitate use of “endemic” water for restoration rather than water brought from the camp water source.

- The team that attempted to descend the Milky Way pit noted that descending this pit requires the cleanest possible clothing and rope, so they suggest that future teams push these leads early in an expedition.

Ropes and Rigging

- Team members generally had favorable comments regarding the new configuration of the safety line at what is colloquially known as the “Tilt-A-Whirl” on the route to the Far East camp, just beyond the Silver Bullet passage. Negotiating this passage with a camp pack was made easier by tethering the pack directly to the traverse line.

- A 100-foot 8 mm static rope was rigged from top of the highest climb in the MODA survey (MODA24) down into the Hall of the Dancing

Bears, in order to access the two remaining leads out of the room at the top. The rope is redundantly anchored to two solid natural anchors, using a separate 60-foot 8 mm static rope, but there are several rub points along both the anchor rope and the main rope. Any team pushing these leads should climb very gently, should bring at least two rope pads, and should be prepared to replace the 8-mm rope with a clean 11-mm rope if either lead continues. Also, this climb should be ascended while wearing aquasocks, due to the flowstone and draperies encountered during the ascent.

- Neither of the lower two climbs in the MODA survey were left rigged. The few remaining leads above the Nutella Pumpkin Pie climb could be accessed by a climber comfortable at the 5.6 level by repeating this climb using the window-threading and top-rope techniques that are described in this report (note-the first couple of moves are “bouldery”; e.g., somewhat harder than 5.6, and a fall, particularly near the top, would result in a significant pendulum swing). A 50-foot rope would be long enough to establish a fixed rope on that climb. No known leads remain that would require re-doing the climb at MOD9A.

- A 60-foot 8-mm rope was left at the top of the MOD13 climb. This rope should be adequate for descent of the Milky Way pit, but only if webbing and carabiners are used for the anchors. Rigging for this pit is described in the original (2005) notes.

Acknowledgements

I would like to thank several individuals for their assistance in making this expedition a success. First and foremost, I was extremely fortunate to be able to work with a great group of cavers, who all donated over a week of their time to participate in the expedition. We received invaluable assistance from the NPS Cave Resource Office staff, particularly Stan Allison. We also continued to benefit from the extremely helpful assistance of Peter Bosted,

whose suggestion that the MNL survey deserved another look led to the discovery of the Coral Sea in 2005. Pat Kambesis and Joel Despain provided us with lists of tasks to be completed in their respective quads.

The 2006 Legnini-Jones Expedition

Upper F—Ghosttown

September 9-16, 2006

Peter Jones

Dan Legnini	Peter Jones
Dave Jones	Chris Andrews
Bob Lerch	Dave Levy
Charley Savvas	Carol Vesely
Michael Queen	Tim George

Dan Legnini and Peter Jones led an expedition into the H39 Quad Map area. The area encompasses several major surveys including Snow White's Passage, upper portions of Apricot Pit, Lemon River and Insane Asylum, S & M Crawl, Hoot 'n' Holler Hall and the Ghost Town area. Paul Burger, cartographer of the quad, had divided sections of the map into prioritized, color coded areas with task lists for fixing/confirming survey data, upgrading the quality of sketching or checking leads from the original survey notes. Dan and Peter further coordinated the lead list by color-highlighting and labeling specific leads on enlarged versions of the quad map that teams could take into the cave. Maps were further enlarged, enhanced and subdivided into area-specific versions for route finding and task completion.

Because the areas were close to the entrance, all trips into the cave were considered to be day trips. Most teams left the hut by 10 AM and returned between 1 AM and 5 AM with one team returning from Ghost Town around noon the following day. This allowed for four trips into the cave during the week of the expedition with recovery days in between. Pretty comfortable caving considering that each day ended with a shower, a hot meal and a cold beer!

The team consisted of a variable number of participants, several of whom came in or dropped out during the week of the expedition itself. Significant hair loss occurred in trying to fill in for last minute drop outs!

In-Cave Day 1

Dave Jones, Dave Levy and Chris Andrews headed towards the end of the EPE survey by way of a short cut through the EA survey, transporting climbing equipment for two leads in the Pomegranate Dome/Chamber of Delight area. They pushed the FX survey beyond FX17 and surveyed about 400' in several side leads, some scooped, some virgin. They exited through another shortcut, the EFA survey.

Peter Jones, Charley Savvas and Tim George took on the task of the resketch/resurvey of the start of the EPE survey through The Insane Asylum. This was accessed from the top of Apricot Pit at the bottom of the first nuisance drop. Many of the survey stations had been lost or moved around due to traffic through the area, so a complete resurvey with the new EPCT designation (labeled PCT in the cave and data, but will be corrected) was determined to be the best alternative. Survey and inventory was completed to station EPCT 18 and several



Michael Queen
beneath the
Ocean Wave

Photo by Peter
Jones



The Pearled Olive
Photo by Peter Jones

tie-ins were made.

Dan Legnini, Carol Vesely and Bob Lerch began a resketch/verification of the EA survey. Stations were easily recoverable and allowed for quick verification or resurvey where needed. It quickly became apparent that several areas between the EA and FX surveys were poorly represented by the original survey and sketch data, changing the scope of the task at hand. Several small leads were checked and surveyed to their end.

In-Cave Day 2

The D Jones/Levy/Andrews team headed to the end of the EPE survey and began a climb up to a balcony in the Chamber of Delight. The team determined that despite best intentions, some restoration work would be needed after completing the climb. Brushes, plastic sheeting and spray bottles were procured in town the following day for use on the return trip.

The P Jones/Savvas/George team was joined by Michael Queen the second day. Michael took over the inventory duties while the survey was continued beyond EPCT 18. A tie-in was made to the EPB survey (the beginning of the S & M Crawl area) in two locations. Several side leads were checked to no avail. The survey continued to the intersection with the EFA survey before the team exited the cave. On the way out, it was noted that there is extensive passage below the

main trend of the EPCT survey (ne' EPE), some of it scooped, none of it surveyed. The plan was to return the following in-cave day and continue this survey.

The Legnini/Vesely/Lerch team returned to the EA survey to continue their resketch/verification of the area. At one point during the survey, Carol was seated on an "arm" of a boneyard type protrusion in a steeply sloped pancake area. Without warning, the entire arm suddenly broke and sent Carol, her sketch book equipment and the broken rock careening down a hole, potentially to God knows where. Luckily, Carol was not significantly hurt in the escapade.

In-Cave Day 3

The drop-out virus seemed to infect several people on this third in-cave day. Tim George had already planned on not participating beyond the first two days. Charlie Savvas, who on the previous days had respiratory problems, dropped out early that morning as his condition had worsened (it ultimately proved to be pneumonia with possible histoplasmosis or malarial complications). Potential local replacements for Tim George were not to be found that day due to scheduling conflicts. Thus a decision was made to create a team of five, comprised of Peter Jones, Michael Queen,



The Martini Pool.

Photo by Peter Jones



Dave Jones scouting the climb.

Pomegranate Dome area to scout for leads. A climb of 80' led back to the base of the rope out of Chamber of Delight. The team then started the main climb in the Dome itself, placing 2 bolts before returning to the surface.

In-Cave Day 4

The fourth and final day involved plans that changed progressively as the day proceeded. With Charley and Tim gone and no local replacement cavers in sight, the team of five from the Ghost Town trip agreed to travel together and work in two areas within immediate proximity of one another, the EPCT survey and the EFA survey. Peter, Michael and Carol traveled to the cave early with Carol expressing concerns about her knee, most likely having been injured in her boneyard sleighride earlier in the week. By the time the three team members reached the entrance, it was clear to her that she could not proceed. With Carol out of the picture, the team was reduced to four members. The decision was made to take the "shortcut" route through the EFA survey off Snow White's Passage directly to where it intersected with the EPCT survey. Several leads were located, checked and surveyed along the way. Due to the delays in entering the cave as a result of Carol's injury and the lateness of the

Dan Legnini, Carol Vesely and Bob Lerch, with Ghost Town as the destination. Michael and Peter traveled as a team of two, followed closely by the balance of the team.

Ghost Town is a large and well-decorated room. The early survey and sketch of the room was done at a scale of 1" = 50 feet, smaller than the current Park standard of 1" = 20 feet. As a result, a resketch of the room was a high priority, along with verification and/or resurvey to correct closure errors. Several significant errors were found, the most egregious being the very first station checked in the middle of the room by pure chance! It is also interesting to note that the person who first sketched Ghost Town at the smaller scale is the same one who returned to resketch it many years later: Carol Vesely. Well done, Carol! A small dry nest of cave pearls was found by Carol, one of which had a hollow underside, much like an olive with its pimento missing. As such, the Pearled Olive now resides in the Martini Pool.

The D Jones/Levy/Andrews team returned to complete the climb of the previous in-cave day, only to have it dead-end another 15' higher. Restoration work was completed after clearing the rope. The team then descended into the



Dave Levy beneath the Dome.

hour, the team left the cave without the opportunity to complete the EPCT survey, a major production for a future expedition.

The other team returned to Pomegranate Dome to complete the climb, which did not go. After restoration of the climb area, the team scouted and surveyed a small flowstone hallway beneath the main room, previously visited by one or two unknown persons. They also discovered virgin passage off the same room, naming it "Southern Blues", adding adding approximately 600' of new passage using the survey designation EPL1 - 10.

Other Points of Interest

In all, 1498.3 feet of new passage was surveyed and 2549.93 feet was resurveyed, verified/corrected or resketched. All of this but 586.6 feet of Ghost Town was inventoried, having been done on a previous expedition.

The D Jones/Levy/Andrews team discovered a small mineral uranium deposit on the first day. It is located near EAT2A - B.

The entrance drop rope has been replaced as of the end of this expedition. It was well-worn, frayed and generally stiff. Cavers round the world are rejoicing.

There still remains a significant amount of work to be accomplished on future expeditions. The lead and survey correction task list is still long. As always, we appreciate the opportunities the Park has given us to help explore and document this beautiful cave.

Far East Expedition

September 24 – September 30, 2006

John Lyles

John Lyles organized and led a 6 day survey expedition in the Far East branch. A team of four cavers (Andy Armstrong, Brian Kendrick,

John, and Paul Mozal) started out, entering on Saturday and surveying on Sunday above Silver Bullet in the GWIZ survey with leads remaining from 2005. One small lead in flowstone was surveyed by clean cavers about 95' before it was blocked by soda straws. It was named (by BK) the Insane Whopper, although the entrance crawl was extremely tight. Another lead was surveyed up to an overlooking balcony above the Silver Bullet. This had been previously scooped by someone in muddy attire, so it was restored to a clean state by the team after they surveyed it.

On Monday the team went to El Malpais, a newly discovered area found by Lyles in 2005, located about 150 feet up fissure above Lake of the White Roses, the deepest point in the cave. They quickly tied into an old lead reached via the Stone Daggers of Death crawl. They continued surveying a 2005 lead into corroded boneyard that opened wide and laterally headed east and west along the same feature that made the rift down to the lake.

They encountered many rafts, then the beginnings of folia, followed by the discovery of small rusticle-like stalactites. A curious new speleothem was named the Rusty Wire. It resembled a cluster of long soda straws except that it was not uniform or straight, and had branches and loops near the center. It had a coating of orange/tan, resembling an old steel fence wire. It may be of biologic origin, and further investigation is warranted in this area. The area was called Rust Never Sleeps. One caver began to feel ill so they headed back to camp to consider options.

The team accompanied him out on Tuesday for medical attention in Carlsbad, and three cavers returned to camp in the Far East branch on Wednesday evening. This was a much quicker and easier trip without camp packs.

On Thursday, they went to the recently-discovered Coral Sea area along the NE edge of

the Outback. It had been found by a 2005 expedition behind the Purple People Eater formation.

They surveyed into a lead up a brown/orange flowstone-coated boneyard above Lake Aloha, changing caving attire from dirty to clean, to dirty again.

The lead went into a series of boneyard crawls, which terminated in one direction in spar. In the opposite direction, they continued into a larger room, which had a large siltstone dike through it.

At this point, they were only about 50 feet beneath Boundary Waters, a wet area close to the upper camp level in the Far East. Unfortunately the trip back to camp was a long way, with clothing changes and delicate chambers, and the climb back up from Outback through Ruby Chamber to Grand Guadalupe Junction.

On Friday, the team headed back to Rust Never Sleeps in El Malpais, continuing surveying in the opposite direction from Monday. It was much tighter, and when a pendant broke off and dropped on one cavers boot, they called it a day and headed back to camp.

The chamber where this happened was named the Purple Pinky Pincher. They returned to the surface on Saturday. Despite the two-day interruption of four treks to and from the entrance to the most remote camp in the cave, the small team surveyed 1116'. Of this, 1099' was new passage added to Lechuguilla Cave's overall length

Near East Expedition

October 14 – 21, 2006

Mark Andrich/Doug Warner

New passage surveyed 468.8'

Passage resurveyed 1655.3'

Blunder footage checked 948.7'



Rusticles Camp

Total footage surveyed 3072.8'

Overview

Six cavers converged on Carlsbad Caverns National Park intent on descending the depths of Lechuguilla cave in mid- October 2006, with the goal of further defining the intricacies of the lower Near East section of the cave. This report summarizes the work done, according to our proposal submitted in December of 2005. We had several primary goals, including resurvey, resketching, lead checking, and blunder repair. We also had a number of lesser goals related to these four areas, as well as some administrative and maintenance work in the Near East area. Some of this work remained from the June 2005 Miller/Maynard expedition, during which Mark and Doug worked within this same Near East area. In addition to research done from previous trip reports and sketches, we incorporated tasks and leads from primary cartographer Rod Horrocks and blunder lists assembled by Peter Bosted.

The six cavers, and their respective skills, were:

Mark Andrich, Expedition Co-leader, Sketcher

Doug Warner, Expedition Co-leader, Sketcher

Bob Biddix, Lech experienced, photographer

Bruce White, Lech experienced, sketcher, photographer

Joe Sikorski, New, Sketcher

Jonathan Griffith, New, photographer

Saturday October 14

Doug, Bob and Jonathan hiked to the cave in what started as a heavy rain, but the rain tapered off as they reached the cave. They signed in at the airlock at 15:20 and proceeded to check the water level at the first 2 pools in the cave. The first was the same as recorded by Lyles in September, but the second (Little Lake Lechuguilla) was down by 0.8 feet, a substantial drop from the Lyles reading. Lyles' reading showed a down trending level, but this 0.8' was even more pronounced. Bob and Jonathan flipped and re-rigged the rope at the second flowstone slope below the Wooden Lettuce passage. There was noticeable, but not unsafe, wear on this rope, and it should be checked regularly. The team completed their trip to Rusticles Camp without further note, arriving at 21:10. After determining a suitable layout for 6 cavers, they set up camp.

Mark, Bruce and Joe hiked to the cave in cloudy weather, but the rain had stopped. They signed in at the airlock at 16:30, and proceeded without incident to camp. Bruce had never been down Apricot Pit, and this was Joe's first time in the cave. Both negotiated the pit, and the trail, well and traveled easily. The team arrived about 22:00. All members of both teams

discussed the erratic rappel on Boulder Falls, attributing it to the unsatisfactory New England rope and its apparent propensity for creating flat spots, which makes the rappel slow, interspersed with rapid drop from time to time. We recommend this rope not be used for long rappels such as Boulder Falls.

Sunday October 15

Team 1

Doug, Joe and Bruce left camp at 13:00. They first stopped at the Lake of the Blue Giants to record the water level. It remained unchanged from the last time Doug and Mark checked it in June of 2005 (and was essentially unchanged all the way back to November 1996, which was Mark's first foray into the cave). The team proceeded to the Bell Tone Passage, which is the GVZ survey, and went to the end of the passage where a lead had been noted at the pit there. A 60' push rope was used for rappel, and although it was about 8' short, it was easy enough to down climb the wall from there. We had a lead noted at GVZ 8, and it was merely another hole to the bottom of the pit, where 2 pools of reasonable size and depth were noted. As this did not exactly correspond to the one pool noted on the original sketch at GVZ 9, Joe sketched 2 additional stations to properly locate the pools, using foresights only, to minimize

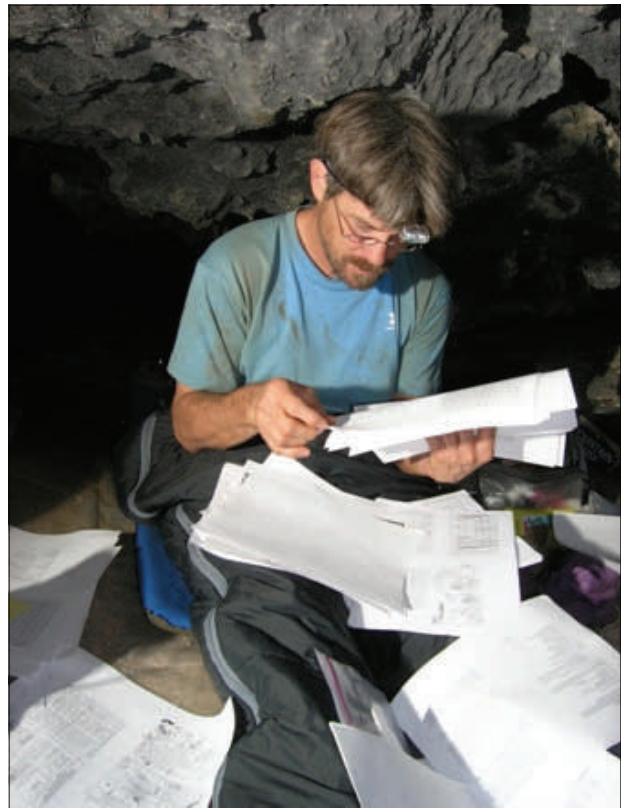


GVE 18 Pool
continuing to the
left.

impact. Doug and Bruce checked the high fissure above GVZ 3 and 7, and determined that it did not go, but was just that, a high ceiling.

On completion of this task, the team moved out to GV 41, which is the major junction in the East Bull Passage, and proceeded to check noted leads within the GO survey, at GO 4, 8, 9, 14, 22, and 23. No lead went even a short distance. All ended very shortly (less than 10 feet) after the survey station. The GO4 up lead connects to GO8, the GO8 southwest, up lead pinches to nothing. Of note, this lead is above a long string of blue flagging with "PISSER" written on it. The team was unsure if this was an indicator of a prior urination area, or simply a comment on the propensity of dead ends in the area. The GO9 "tight above" lead was nothing--there is no lead there. The GO14 multiple leads are: east lead connects to GO5, west lead #1 connects to GO13, and the west lead #2 is too tight. The GO22 north lead is too tight and delicate to enter, but it has a light connection to between GX4 and GX5. The lead at GO23 is actually (and obviously) the GX survey. The team returned to GV41 to find the next survey.

After determining the location of the GVV survey, the team followed it until it became too delicate. It became apparent that the survey went through a spectacularly fragile and white aragonite forest. At this point Doug switched to aqua sox and followed the survey solo while the rest of the team waited so as to not impact this delicate area any more than necessary. Doug followed the survey to the lead listed at GVV21. The lead was promising, but pristine and very small. The lead was between a sturdy column and a flowstone wall with an obvious room on the other side. After removing all clothing that had any trace of dirt, Doug pushed through the lead. The entrance was exceptionally tight causing both the chest and back to be compressed while entering, and a helmet could not be worn while doing this. The



Mark Andrich sorting through the daily tasks

small room on the other side of the lead was approximately 10'x10' with a 7' ceiling. It had an exit to a lower room approximately 4'x10' with a 9' ceiling. While approximately two survey shots could be made into this area (one for each room), Doug determined it would cause more impact than it would be worth to gain an approximately additional 20 feet of survey. There were no other leads in the area, so Doug returned through the constriction, reclothed, and picked his way back to the team. The GVV survey is exceptionally fragile and pristine, and now that there are no reported leads there is no reason for anyone to ever return and impact this area more.

Team 2

Mark, Bob and Jonathan left camp at 13:00 and headed for the Bell Cord Passage, the GVE survey. Goal for the day is to resketch this survey, which was done originally in 2 sections several months apart. We re-shot and resketched using the original stations up to

GVE 9, used original 9 - 10 - 11 data for sketch only, shot to GVEA 1 - 3 with new stations 12 - 17, and added station - 18 across the pool (no flag, since we did not cross the pool). The pool is about 18' long, 5' wide, about 15' deep, and the lead across is 6' beyond station 18, 2'W x 3' H sloping down to the west. It would require a bold stem/chimney maneuver with clean gear to reach it, but it could be done without damage to the pool. There also is a shelfstone ledge at the water level, but this may impact the water in the pool. We took several pictures to submit to the Cave Resources Office. We essentially eliminated the GVEA survey, but we left the flags in the cave, so this survey designator should remain in the "used" column. We did not do any restoration as suggested in our original proposal, though this could still be considered for the future.



Confirming the GZZ1-GX10 tie-in

Monday October 16

Team 1

Doug, Bob, and Jonathan left camp at 14:30 and headed for the Giant Chiclets area. Along the way, the double 8mm hand line at GPB 13 was replaced with 35' of 11mm and rigged to a higher, more secure rig point. Then the hand line at GX 20 was replaced. The old rope was in pretty good condition, so we kept it in the cave at camp for future use. Its length is approximately 30'.

We then went to GX 11 to begin blunder correction. In all, the team checked stations GX8 through GX13 with tie in shots to GR1, GZZ1, and GVM1. GRX7 could not be found, and was listed as 2' vertically above GX9. Since the ceiling height above GX9 is at least 12' (not measured) and there was no obvious hanging station or flagging marking GRX7 (in spite of finding flagging for GRX6 some distance away), GRX7 was determined to be lost and to require a fair amount of effort to recreate. It appears that the obvious blunder (given the data) comes from the assumption that GX9 can tie to GZZ1. This is not possible and GX10 is the correct tie to GZZ1. The data listed for

connecting GZZ1 to the GX survey agree with GX10 as the tie in station.

After surveying the blunder series, the team then continued backwards along the GX survey checking listed leads. The two high leads at GX11 connected by sight to GX14F and GX14C, but each lead was either too delicate or too precarious to survey. At GX8 there was a lower lead that connected to both GX9 and GX6. This connection was surveyed as GXA1-GXA7. The other lead at GX8 was to the same room as the lead off of GX7. The GX7 lead connected to GVM1 and this connection was added to the blunder correction survey data, above. Of note, the GVM survey was labeled GVM on the flagging in the cave, but due to the previous day's investigation of the GVM21 lead it was apparent that this survey was mislabeled. Upon consultation with the line plot it was determined that in fact the correct designation for this survey should be GVM. We left a note at GVM1 indicating that it was likely mislabeled. Since this is a relatively short survey, we decided it was probably not worth the effort of replacing all the flagging, especially

without planning to resurvey (and hence potentially missing stations). If the Park decides that this survey should be relabeled in cave that can easily be done on a future trip.

All other leads listed on the GX survey connect in short order to other surveyed passage (except one lead from GX5, to be discussed in the Tuesday, 10/17 report). The lead to the west from GX5 connected to GVM3A (incorrectly labeled in cave as GUY3A) (not surveyed), the west GX2 lead connects to GRA69 (not surveyed), the west lead from GX3 ends within 10 feet, and the west lead from GX1 is actually the GVH survey (connection not surveyed). ** (NOTE – The GVH survey is one of the blunder loops we did not get to, this tie and blunder area will be done on a future trip).

Team 2

Mark, Joe and Bruce left camp at 15:00 and went to the end of the Volcano Rift, to resketch and resurvey the GPA and GPB surveys. We began at GP 1 in order to resurvey and resketch the GPA (1988 vintage) survey, from -1 to -7. GPA continues to -16 with several side shots (1993?) so we did not go beyond -7. We noted a high lead at GPA 3, and noticed flagging that said “no leads high or low, loops back to known passage” but we did not survey this checked but unsurveyed passage. We will include this in a future trip.

We then tied GPA 5 to GPB 1 in order to resurvey and resketch the GPB survey, which was one of our primary goals for this trip. Cartographers Pat Kambesis and Rod Horrocks both list this as one of the surveys most in need of updating in this area of the cave. The GPB survey is also the main trail through the Crinkle Blister passage on the way to the Giant Chiclets. We were only able to confirm the location of GPB 1, and re-set new stations and a few additional stations (GPB 10A and GPB 12A) to facilitate clear shots. We were able to tie GPB 14 directly to the new (2005) GX 29, and so eliminated GPB 15, which we were not



Unusual filament pool spar in GVX survey

able to locate in either case. We will still need to shoot a few ties in this area to the GZD survey, but this did not hinder our primary objective. We labeled all new stations with the date 10/16/06.

While in this area we also shot a new tie from GPB 11 to GZD 19 (see 10/17 summary below) after first correcting a blunder at GZD 18 and establishing a new GZD 19. We also shot new survey at GPB 3 with 3A and 3B down a tube to a dead end room for 37.2' of new survey. At GPB 6, there is a fairly large and highly decorated (with aragonite popcorn) alcove, with flagging indicating that it had been checked and no leads exist. Perhaps, but this alcove is much larger than many of the passages currently being surveyed in the cave, and so will be included for thorough survey on a future trip. We also took pictures of the entrance to this alcove.

Tuesday October 17

Team 1

Doug, Bruce and Jonathan left camp at 15:50 bound for the Giant Chiclets area. High on the list was to check a lead at GX5 that needed additional investigation. In addition, there was one more lead and other blunders in the Giant Chiclets that required correcting. Upon arriving at Giant Chiclets, Doug switched to aqua sox and did the climb/traverse listed as a lead above GX14C. Straight above the climb the lead



Resurvey at GVX27

pinches. After a tight delicate traverse a connection was made to GX23I (the letter I). This connection was very exposed, tight, and delicate, so was not surveyed.

The team then proceeded to do the GX23 blunder correction series. In all, GX23A-G, N, P, H, and K were resurveyed with connections to GX23, GZZ3, and GX12. In addition, since we were once again at GZZ3, we decided to further clarify the connections between the GZZ and GX surveys by connecting GX23N to GZZ1 and GZZ1 to GX11. Hopefully this should eliminate any confusion around the GX9/GZZ1/GX10 stations. No obvious blunders were found.

After completing the blunder corrections the team went to the GX5 lead and discovered an interesting passage. We surveyed GXB1-8, tied in from GX5. The GXB survey is interesting because it is in boneyard with corrosion residue

and strong, obvious wind. In the relatively small passage the air movement was strong enough to move flagging! The team pushed this passage, but in every direction it became too tight. The air flow is interesting since the passage is on the edge and below other passages in the area. Any continuation in this area would require some passage modification.

Team 2

Mark, Bob and Joe left camp at 17:00, headed for the GPC survey, which begins at the hand line climb up into the Crinkle Blister passage at GPB 1. We determined that the GPC survey is noted in the proposal as “snarly briar filled boneyard impossible to sketch”. Since Joe did not know it was impossible to sketch cave passage, we made him do it. We reused the original stations except for GPC 6, where we set a new hanging station for a better shot. We went to GPC 10, which we had to re-set since it was on the main trail, and then tied to GPB 3. We then went to GPB 11 to correct the blunder, as mentioned in the 10/16 report, from GZD 17 – 18 – 19 and tied 19 to GPB 11. The distance between 17 and 18 was off by about 9’ from the original data, and we had to set 18 in a better location.

Wednesday October 18

Team 1

Doug, Bruce and Bob headed out of camp at 17:00 bound for the GVX survey across from the Blue Giants, in order to resurvey, resketch, and correct blunders. We found GVX 40 and followed it to GVX 1 (it is a loop survey) and began the survey with a tie to GV 29. Finding and following the GVX survey was made more difficult because the station markers were small (1cm x 4cm) Mylar pieces with a 1cm x 1cm patch of non-reflective green tape on one side. In spite of this, most stations were found and resurvey was done through this difficult area. The survey itself was difficult, going through small, delicate, sometimes high angle areas. Many leads were checked during the first half of the survey, resulting in finding one unlisted

in the original survey at G VX19. This high lead was pushed through very tight boneyard and breakdown until the discovery of scoop marks coming from an alternate direction. Due to the difficult nature of the lead to survey, it was left for a later trip. Unfortunately, there is no easy way to get through the G VX survey to G VX19 from either end of the G VX survey without potential impact.

Due to the small and fragile nature of the G VX survey, it took quite some time to progress. By the time the team reached G VX27, fatigue was evident, so we did not resurvey the side shots of G VX28-G VX31. However, it was noted that G VX29 did have a lead that reentered the Bull Passage area with no tie-in, and above G X28 there was a high boneyard lead worth further investigation. Resurvey continued from G VX27 to G VX32 on out into the Bull Passage (G VX37) and after much searching for stations in this large passage, on through G VX41 and back to G VX1. The team returned to camp via the Orange Bowl at 7am after more than 12 hours of survey.

Team 2

Mark, Joe and Jonathan took off at 17:30 for the G TE survey at the east end of the Volcano Rift, to check leads noted on our list, at 11, 22, 24, and 28. G TE was surveyed originally in 2 sections, 1 – 18 and 19 – 30 and beyond. At 11 it appeared that the lead went to this newer survey, but we did not shoot any ties. As we came to 18, we noticed the original sketch listed a possible lead in the floor, and we saw scoop marks for a short distance, so we began our survey at G TE 19. We used G TE 19 A – O, for 184.4' of new survey. At 19E, the passage continued down a steep, decorated fissure with light, but noticeable air. Up and to the right beyond was a small, tight, decorated area, and Joe chose to survey and sketch this area himself, so as to limit the impact of the entire team. The passage then continued low to the North, tight and grabby, to a room 8 x 15, about 5' high, with a good breeze coming from



Delicate nature of G VX survey

the floor along both walls, enough to chill the sketcher and flutter flagging. This room appears to be the top of a breakdown pile, indicating possible potential below, especially since this area is just off the map with nothing noted below. We then made our way out, and followed a flagged trail from near G TE 12 up and into the western edge of the Great Beyond room, about mid level. Although this trail is clear and flagged, it does not appear from the line plots to have been surveyed to tie the G TE survey to any survey in the Great Beyond. We will propose to check, and survey if necessary, this section on a future trip. We descended to the main trail and returned to camp at 3:30am.

Thursday October 19

Team 1

Doug, Joe and Jonathan headed for resurvey along the Orange Bowl, Snow Fall Hall, and East Bull areas at 19:30. Work began just past the Orange Bowl on the G EA survey. This resurvey and resketch was done without incident except for the tie from G E10 to G G1 which was obviously not where the flagging indicated. Our best guess is that the tie-in was originally mis-measured by 1 foot and G G1 is a convenient handle on the main trail, making any flagging placement temporary. Of note, Jonathan had expressed an interest in learning more about sketching during the trip, so he assisted Doug during the sketching tasks on this



Delicate, unsurveyed alcove at GPB6

survey as a learning exercise. Jonathan definitely has some talent with sketching due to his art background. He will likely be a candidate for Park sketcher status after practicing his technique at other caves.

From the GEA survey the team began to look for the GDK3-GD10 tie in blunder. This took an unexpectedly long time to find the survey stations. After discovery of the stations, the resurvey was completed rather quickly and the team moved on to find the next blunder series off of GV14. Apparently there was accumulated team fatigue from the week since we could not find any of the lower numbered GV stations. The first GV station found was GV29 (known by Doug from the previous day) and as the team was trying to find GV28 from the line plots to work backwards towards the GV14-GV20 blunder series.

Team 2

Mark, Bruce and Bob left camp at 19:30 and went to GPB 3 to survey a short down sloping tube just off the trail, using 3A and B for 37' of new passage. The team continued to GPB 6 to photograph the entrance to a large, popcorn encrusted alcove to the South. This alcove is also right next to the trail, and although a flag says "no leads" etc. it is certainly large enough to not have been surveyed. We will include this task on a future trip, as it appears there may be possible leads to the south in the alcove. Then the team was off again to the GZD survey to find and correct blunders in the breakdown. We first checked GZD 7 to 14, where a 90 degree clinometer shot was found to be reversed. We next determined that the shot GZD 29 to 40 is actually from GZD 38 to 40. We then made our way to GZD 1 to check the tie from GZZ 11 to GZD 1. We shot from GZZ 11 – 10 – 9. GZZ 10 – 11 was not in the data, and the line plot shows a dead end, but this tie was apparently made in the cave originally and perhaps lost or mis-recorded.

We followed the GZZ survey out to the GX main trail survey, and went to the lead surveyed by the Warner team at GX 5. We confirmed the airiness of the lead noted by Warner. We then headed back to camp via the Blue Giant route, and ran into the Warner team.

Friday October 20

Due to surface travel considerations and the fact that we were rolling forward on our daily caving time schedules, we decided to exit the cave on Friday in order to have a full day to attend to the paperwork prior to leaving the Park. Doug, Joe and Bruce left camp about 15:30 and made their way out of the cave without incident, exiting at 21:20 to a beautiful cool clear sky. Mark, Bob and Jonathan left at 16:30 and also took our time leaving the cave, making the surface and de-rigging the entrance at 23:30. Hiking beneath a star filled sky, we returned to the hut at 00:45.

North Rift Expeditions

Steve Reames

Expedition Leader: Steve Reames

May 28, 2006

Team1 Steve Reames, Carl Bern, Derek Wolfe

Team2 Jeff Goben, Amy Bern, Barb Smith

All six members traveled to the Hub in Level+1 of the North Rift (CHG11). At that point Reames, C. Bern, and Wolfe backtracked to approximately CD6 and started the CDD survey. The goal was to survey from the top of the rope drop, across the traverse, and arrive at the Hub. This team surveyed approximately 430 feet. Some of this survey may need to be excluded, pending on the results of the final plots. Goben, A. Bern, and Smith took an unsurveyed lead below the Hub near CHH3. The new survey is the CHGE. This survey is tight and grabby, so team 2 only achieved approximately 107 feet, all new survey.

Est Total new survey: 539 feet

Est Total re-survey: 0.0 feet

October 22, 2006

Team1 Steve Reames, Rick Speaect, Shawn Thomas

Team2 Jeff Goben, Barb Smith

Everyone drove together to the cave. The first person went in about 8:30am. We continued to the Rift, then backtracked slightly to take the CD route (aka. the step-across). At the top of a small maze near The Hub, we split into two teams.

Team 1 consisted of Steve Reames, Rick Speaect, and Shawn Thomas and started on a lead off of CDD8. Team 2 consisted of Jeff Goben and Barb Smith and they continued their previous work around The Hub. Team 1 started the CDE survey which only went five stations before ending.

We continued to the mazy area over The Hub and picked the last lead from CDD9. After one station we found we could stations in each direction, so we tied into those stations, and we were done. We found that we were done with the mazy area. Team 2 also found only one more lead off The Hub and completed their survey (CHGG).

Surprisingly, we believe we are done with Level +1 now! There are a number of older surveys which have not been added yet, so we may find that we need to clean up a couple surveys, but we are mostly done. That leaves Level +0 which only needs a couple re-checks and measure ceiling heights with the Disto.

Total new survey: 83.1 feet

Total re-survey: 0.0 feet

Far West Expedition

November 4 to 11, 2006

John Lyles and Peter Bosted

Personnel: Andy Armstrong, Bonny Armstrong, Peter Bosted (co-leader), Daniel Chailloux, Matt Covington, Elizabeth Covington, (first trip) Darren Dowler, Jen Foote, Brian Kendrick, Heather Levy (first trip), John Lyles (co-leader), Michel Renda

Everyone entered the cave on Nov. 4 and traveled to the Deep Seas camp, rigging a new rope at Boulder Falls on the way.

For the next five days, they split either into three groups of four, or four teams of three to survey in various areas in the Far West.

Two days were used to finish the detailed re-survey of the Mother Lode. Two trips to the Chocolate Factory resulted in 683' of new passage, mostly boneyard coated with white calcite crusts and aragonite bushes. A good-sized and well-decorated pool was added to the collection in this area. A connection was also made to the Adobe Room.

In the nearby Widow Maker area, three of the many leads in this massive breakdown complex were surveyed for a total of 450'. Many leads remain in this area.

While mopping up leads in the Leaning Tower / Fun Town area, lead flagging was noticed at the base of a climb, which Matt led the last day with only one piece of aid and a protection sling. This led to a substantial boneyard complex they named Friday Night Fever. A connection back to the Leaning Tower was made from a large opening above a 25' cliff. Over 700' was surveyed in this area, and several leads remain.

Three trips were made up to the Rock 'n' Rillen room area in Southern Climes. There is a large well-decorated boneyard maze under the room called Hahd Coah, featuring some good-sized rooms, some nice orange spar, and much gypsum snow. There is still more work to do in this area, which yielded about 1000 feet on new passage on this expedition.

Teams went to the edges of Helderberg Hall to survey/check leads, and also to Menagerie, along the Oregon Trail near Sanctuary. Both teams returned to camp with new survey and more leads.

A trip to Zanzibar on the Northern Exposure route fixed two small blunders and found 150' of overlooked and heavily decorated passage to survey. A climb was also done, but didn't go.

Finally, a party of small cavers went to the IFB survey off the Mirage Room, to work leads left from 2005. They hoped to make a connection to the EYJ survey near Jackpot or Helderberg Hall.

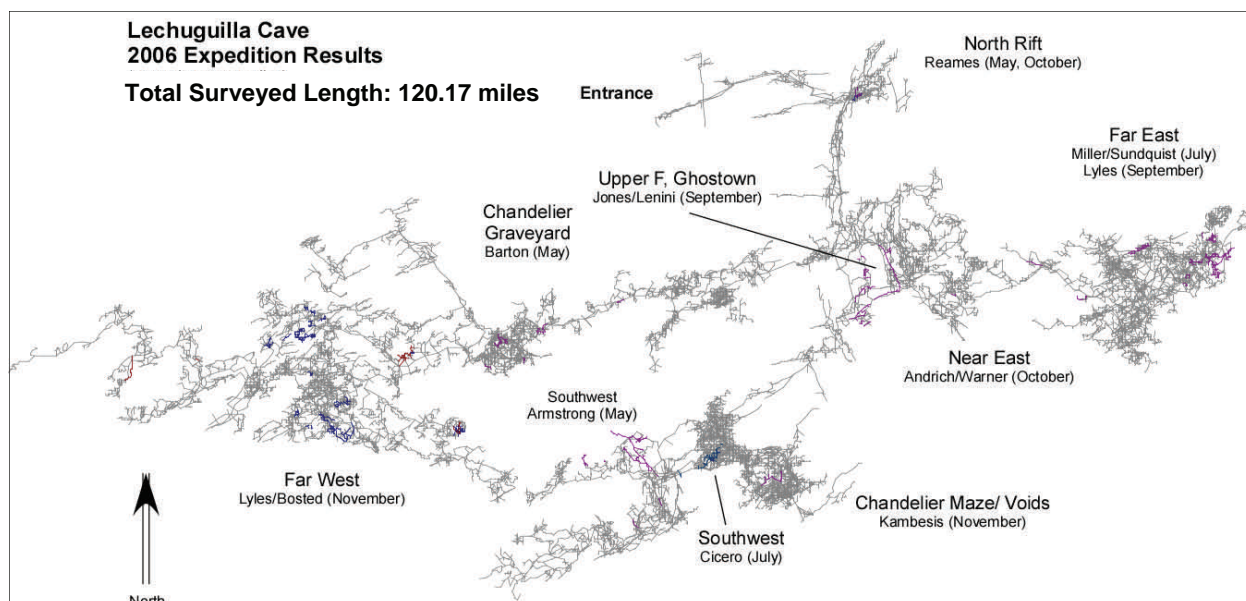
A second team mopped up breakdown leads under the room itself, finding a jumble of unsurveyed boneyard. The IFB team found their passage changing from spar to aragonite bushes, and called it Spah Haabah.

They returned another day, entering via Mirage

Room, from Huapache Highway near Keel Hall, and continued to find Spah Haabah heading up into a large breakyard (breakdown and boneyard) maze, and after surveying through a good-sized room, squeezed up through breakdown to find themselves in the middle of the Jackpot room, thus closing a huge loop. They were able to return to camp via a shorter route to the Leaning Tower.

Two days later, one team returned to map the large room, while the other picked a side lead, which led through spar and aragonite coated breakdown to a complex area of fissures and huge breakdown blocks. Again squeezing up through breakdown, they found themselves back in Jackpot at the base of the Rodeo climb rope, not far from the other connection point.

This area yielded over 1000 feet of survey, and at least one more trip will be needed to finish all of the side leads. 7412' of survey was accomplished, with 6141' of it new passage, adding 1.16 miles to the cave length. It was one of the most productive 'mop-up' expeditions in years.



2006 Lechuguilla Science Summary

Paul Burger

Micrometeorological and Atmospheric Composition Study of Lechuguilla Cave

Investigator: Penelope Boston

The primary purpose of this study will be to characterize the air chemistry, air flow patterns, and the interaction of these major sets of factors that might be leaving detectable traces within the cave. Such potential traces include water chemistry in pools, distribution patterns of corrosion residue and associated microbial communities, and presence, absence, and nature of speleothems that may be associated with various microphysics or chemical effects.

The study hopes to shed light on a number of long-standing questions about Lechuguilla: 1) any indications of gases possibly coming from deeper levels in the cave; 2) clues to the behavior of apparent large convecting cells within the cave (described by La Rock and Cunningham, 1991); and 3) any potential gaseous nutrient sources that could be providing energy to indigenous cave geomicroorganisms in corrosion residue, pool waters, or elsewhere.

Activities

On March 13, 2006 Mike Spilde led a team to the Southwest Branch of the cave, collecting air samples along the way, including Colorado Room, Glacier Bay, Windy City, South Rift, EF-Junction, EA Passage, and Lake Chandelar. On the 14th, they collected samples in the Voids-Big Sky area. They collected both air samples and rock/soil samples from Land of the Lost, Showing Passage, the Voids sulfur area, Big Sky, Pearlsian Gulf, and Lip Service.

On March 15, a second team entered the cave to meet the in-cave team and brought the air samples out for analysis at the research hut in order to keep sample holding time to a minimum. The other team continued deeper into the Southwest Branch, collecting air and rock/soil samples from Prickly Ice Cube Room, Land of Awes, Darktown, Hoodoo Hall, and the Terminator Room. The following day, they headed out of the cave and collected replicate air samples, repeating the samples collected along the route from Lake Chandelar to the Colorado Room. The first set of samples brought out were analyzed at the research hut on a portable gas chromatograph.

Chemistry of Redox-Sensitive Elements in Lechuguilla Cave Seepage Waters

Investigator: David Levy

The purpose of the study is to investigate the oxidation-reduction (redox) status of Lechuguilla Cave waters to understand the potential role of seepage chemistry in the overall biogeochemistry of the cave. The role of seepage as a source of iron and manganese in secondary oxide minerals, and the contribution of seepage to nutrient loading within the cave, has not been well-characterized. Dissolved forms of iron, manganese, and nitrogen in groundwater seepage were measured to evaluate seepage as a source of these constituents to the cave. Ancillary activities included opportunistic sampling of selected cave pools to evaluate historical trends in major ion pool chemistry.

Activities

On June 11, 2006 Dave Levy led a team of 4 to collect drip samples from the Delicatessen area, but the area proved too delicate for water sampling. They cached water sampling equipment on the trail at the base of the rope at Buck Rogers Dome, and then left the cave.

On June 12 Dave Levy led a team of 5 into Lechuguilla Cave for a 2-day trip to collect pool and drip samples from various potential sampling locations including: Lake Louise, Wild Wild West, Chocolate Factory, and Treehouse. The team carried water sampling equipment consisting of a combination pH/EC meter, HACH DR-850 colorimeter, oxidation-reduction (Eh) probe, filtering equipment, and sample bottles. The team then traveled through the Western Borehole en route to Wild Wild West. After several hours the caving became increasingly difficult and the team aborted travel to Wild Wild West and attempted to locate the Chocolate Factory through the mazy lower Widowmaker area. Thwarted by route finding and a long day, the team decided to call it a day and return to Deep Seas Camp. On the return trip to camp, Dave Levy and Robert

Lerch collected water samples and conducted field measurements from Lake Louise at 2105.

On June 13 the team made the two-hour journey from Deep Seas Camp to the Treehouse area. Dave Levy collected drip samples from red draperies left of the third rope while others surveyed in the location (sECR11B). Upon descending the Treehouse, drip samples were also collected near the base of the rope at Station EY24. The team returned to Deep Seas Camp at 1600 and packed for the exit. On the way out, Chris Andrews and Robert Lerch tied a drip sampling location e from 2005 into the main survey near EC30.

On June 15 Dave Levy led a team of 3 in Lechuguilla Cave to collect pool and drip samples in the Entrance Series (Liberty Bell Area) and the Southwestern Branch (Pearlsian Gulf Water Supply and Vesuvius). The team placed plastic beakers to collect drip water in the Liberty Bell Area and then traveled to Big Sky Camp where samples were obtained from the Pearlsian Gulf Water Supply. On June 16 the team traveled to Vesuvius and collected water from a ceiling drip (sJF11A), returning to Big Sky Camp the same evening. The team exited the cave on June 17, collecting samples from Lake Lechuguilla, in addition to pool and drip samples from the Liberty Bell Area.

Oligotrophy in Caves: The Biochemistry and Metabolic Activities That Support Microbial Community Survival in Nutrient Limited Environments

Investigator: Hazel Barton

Caves commonly form through the erosional processes of water. Once sufficiently enlarged to allow human access, these waters have long since departed, leaving the cave exposed to an oxygenated atmosphere. The entry of organic nutrients into the system is therefore a function of the geology and depth of the cave system, with significant input from the surface being limited to the entrance zone and areas of the

cave fed by surface water, whether dripping water or actual streams entering the system. The majority of caves therefore represent an essentially oxidized and nutrient limited environment, in which microscopic life subsists by scavenging primarily inorganic nutrients using an oligotrophic lifestyle.

Based on previous work carried out in cave systems, Lechuguilla Cave and Carlsbad Caverns will be used as model sulfur-base systems to continue these oligotrophy studies. To do so, they will use a combination of techniques, including model-organisms, cultivation, biochemistry and molecular phylogenetic techniques to question the following hypothesis:

Microbial communities are able to subsist in extremely oligotrophic environments, such as caves, by establishing a complex carbon-sharing network. Such networks provide highly efficient scavenging mechanisms, allowing a feedback nutrient supply system. Such a system permits increased diversity through augmented opportunities to utilize those scarce energy sources that are available, such as reduced metals in the bedrock and carbon halides in the atmosphere. Further, this diversity is not merely a functional requirement for community subsistence, but can only occur in systems where UV damage does not limit the potential species richness of the community.

Activities

On June 26, 2006 Hazel Barton led a team to the Western branch of the cave to collect rock and water samples from the Deep Secrets, Lake Louise, and Pink Dot Pool areas. On June 27, they collected samples in the area around F88 on the route towards the Southwest Branch. On June 29, they collected rock, corrosion residue, and punk rock samples in the EA survey between EF-Junction and the top of the Great White Way.

Identification of Microbial Signatures in Biogenic Cave Ferromanganese Deposits

Investigator: Diana E. Northup

The purpose of the study is to determine the role of iron- and manganese-oxidizing bacteria in the formation of ferromanganese deposits. Investigators hope to determine the progression of mineral transformation in iron and manganese enrichment cultures inoculated with cave ferromanganese deposits and investigate whether similar transformations occur in rock varnish iron and manganese enrichment cultures. The study will characterize the microbial species involved in the production of these minerals in culture and determine whether previously characterized putative manganese-oxidizing genes are present in organisms found in iron and manganese enrichment cultures.

Information from the proposed investigations will elucidate how microbial life flourishes in this dark, low-nutrient environment, producing an abundance of ferromanganese deposits over geological time scales. Details of the processes and the identities of the players that help produce these ferromanganese deposits in caves and in rock varnish will be determined and will document additional novel organisms from these deposits. The proposed research will provide insight into the geological alterations of iron and manganese by microorganisms and will help to resolve unknown aspects of these alterations.

Activities

On July 8, 2006 Cathy Borer collected corrosion residue samples from three locations along the "rescue" route from Grand Guadalupe Junction. This area, an upper-level bypass to the trade route to Gorilla Pit, contains thick corrosion residues, but has seen little disturbance from cavers. Samples were taken from bedrock and a Neptunian dike found along the route. Sterile samples were taken for molecular DNA analysis and non-sterile samples for bulk chemical analysis.

Dated cave pool shelfstones as indicators of climate change

Investigators: Joel Despain and Greg Stock

The purpose of the study is to date pool shelfstones in caves of the Guadalupe Mountains. Samples will be collected from dry pools or pools with water levels substantially below the level of former pool highstands.

Each cave pool has its own local groundwater point source, resulting in a range of pool levels. Yet, many pools in Lechuguilla and other Guadalupe Mountain caves are not presently at their highest levels, but have instead evaporated to some lower level.

The process by which pools drain is most likely related to both leakage and evaporation (e.g., Forbes, 2000), but departure from the steady-state highstand condition is almost certainly related to changes in the hydrologic input to the system.

For most caves, including those in the Guadalupe Mountains, this input directly relates to the amount of precipitation falling above the caves. In most cases, former pool highstands are marked by calcite shelfstone deposits or related subaqueous deposits (Hill and Forti, 2000).

These former highstands record a local (in-cave) microclimate with greater effective moisture, either due to increased inflow resulting from increased precipitation above the cave, or reduced evaporation.

This research seeks to test whether the numerous pool high stands present in these caves were synchronous, and therefore reflective of larger scale climate shifts, or whether they were asynchronous, reflective of specific local changes in the overlying vadose hydrology.

Activities

On Tuesday, September 12, 2006 Joel Despain and Greg Stock led a team to the Rusticles Camp in the Near East section of the cave. After setting up camp, they proceeded to the Orange Bowl to take a sample. They sampled calcite shelfstone along the edge of a small, dry pool that is one of a series of pools marking the spillover point of the Orange Bowl pool when it reached its highstand.

In addition, they investigated the Orange Bowl for any tilt of the former pool surface. They set up a laser level at two sites along the pool margin (long and short axes) and investigated the opposite side for offset of the laser and the shelfstone. They did not observe any tilt of the pool, within the resolution of our measurement (>1 cm), but more precise measurements would be more conclusive.

On September 13, they traveled to the Far East section of the cave to sample near the Lost Pecos River. They collected one sample near the water-collection site and a second in the dry pool basin prior the Lost Pecos River from the Far East camp.

This basin is dry, but the former highstand is clearly marked with thin shelfstone. They also checked for tilt of this pool basin along its long axis, and did not detect any tilt within the resolution of measurement.

After sampling at the Lost Pecos River, they headed back to the Near East, detouring to Stud Lake and Lake of the Blue Giants to investigate the shelfstones there.

Stud Lake did not have any suitable shelfstones, but there were suitable shelfstones at Lake of the Blue Giants. They sampled a piece of bulbous shelfstone along the upper shoreline of the lake, below where the trail skirts the edge of the lake.

On September 15, the team headed back in for a day trip to the Western Borehole. They sampled bulbous shelfstone from the far end of the Oasis Pool basin opposite where the trail enters the room.

They did not sample the very highest pool stand, which is not represented by substantial shelfstone, but opted for more a substantial shelfstone layer approximately 10 cm lower; this shelfstone marks the prominent pool edge visible in photographs.

After sampling in the Oasis Pool Room, they headed back down the Borehole and detoured to Pool Hall. Here they sampled a shelfstone at the western end of Pool Hall, where the “Boots Off” signs are encountered after climbing the Golden Road rope from FUBAR.

Basic Summary of Lechuguilla Data

Total Surveyed Passage: 120.17 miles	193.3 km
Total Surveyed Depth: 1,608.3 feet	489.9 m
Stations: 29,339	
Inventoried Stations: 10,603 (36.1%)	

Good Loops (<1 standard deviation): 1285 (57.7%)
Okay Loops (1-2 standard deviations): 670 (30.1%)
Bad Loops (>2 standard deviations): 272 (12.2%)